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Isela okuncana, a new genus and species of kleptoparasitic spider from southern Africa (Araneae: Mysmenidae)

by

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ABSTRACT

Isela okuncana, gen. n., sp. n. (Araneae: Mysmenidae) is described from southern Africa. The spider lives as a kleptoparasite in the webs of *Allothele teretis* Tucker (Dipluridae). Cladistic analysis suggests that *Isela* is the sister group of the tropical American genus *Mysmenopsis*.

INTRODUCTION

The tiny spiders of the family Mysmenidae are considered to be among the 'least common and most poorly known' of the apneumone spiders (Brignoli 1980). This has long been the case in the African region, where only *Microdipoena elsae* from the Seychelles (Saaristo 1978) and *Leviola termitophila* from Angola (Miller 1970) have hitherto been attributed to this family. Through recent collecting efforts by the author concentrated on small spiders, particularly those in the cryptic fauna of forests, it has become apparent that there is a rich and diverse fauna of African mysmenids. Among the most remarkable of these is a kleptoparasite living in the webs of diplurid spiders, a behaviour previously reported in this family only for members of the genus *Mysmenopsis* Simon (*sensu* Platnick & Shadab 1978, including *Lucharachne* Bryant) from the American tropics (H. M. Peters, in Kraus 1955; L. Kirkendall, in Platnick & Shadab 1978). The discovery of this behaviour in a new African mysmenid genus of apparently close phylogenetic relationship to the American *Mysmenopsis* is, therefore, of considerable interest.

MATERIALS AND METHODS

For examination of the respiratory structures the dorsa of the carapace and abdomen were removed, the whole spider cleared in warm 10 % KOH for 96 hours, and stained with chlorozol black. Spermathecae were excised, cleared in warm 10 % KOH for 12 hours, temporarily mounted in glycerine, and examined with a Zeiss compound microscope. For scanning electron microscope (SEM) examination all appendages were air-dried and the cephalothorax and abdomen critical-point-dried prior to coating and viewing. Illustrations were made with the aid of drawing tubes mounted on a Wild M5A stereo and Zeiss compound microscope, and photographs taken with a JEOL 200 SEM. Observations of feeding and reproductive behaviour were made under laboratory conditions in webs of captive *Allothele teretis*.

All measurements are in millimetres and are expressed as mean (minimum – maximum) calculated from three individuals. Abbreviations referring to the ocular area, spinnerets, and tarsal claws are standard for the Araneae.

TAXONOMY

Isela gen. n.

Type species: *Isela okuncana* sp. n.

Etymology: The generic name is from the Zulu word for thief, *isela*, referring to the kleptoparasitic lifestyle of these spiders, and is considered feminine in gender.

Diagnosis: *Isela* may be distinguished from all other Mysmenidae in having the PME separated from the AER by a distinct depression (Figs 1, 3, 4), and from all mysmenids except *Mysmenopsis* Simon (*sensu* Platnick & Shadab 1978, in the inclusion of *Lucarachne* Bryant) in having the palpal tibia of the male (Figs 23–26) enlarged, cup-shaped, and with a series of stout apical spines (Figs 13, 16). *Isela* may be distinguished from *Mysmenopsis* by the morphology of the cephalothorax and by having the male palpal tibial spines dorsoapical, on the opposite side from those found in *Mysmenopsis*.

Description: Small spiders, 1,4 to 1,9 mm in length. Cephalothorax yellow-brown to grey, abdomen dark grey with pale markings, legs yellow-grey. Carapace glabrous, with few dorsal and anterior setae; truncate posteriorly, narrowed anteriorly, length about 1,25 times width; low, highest at thoracic fovea, height about ⅜ of width; thoracic fovea indistinct, broadly depressed. Ocular area in both sexes low; AER recurved, PER procurved, median ocular quadrangle wider anteriorly, slightly longer than wide (Fig. 3); PME slightly oblong, on posterior tubercle; lateral eyes contiguous, others separate; AME larger than ALE (Fig. 2).

Clypeus concave, twice as high as diameter AME. Chelicerae vertical, length greater than twice clypeal height; retromargin of fang furrow with few teeth and denticles (Figs 5, 6).

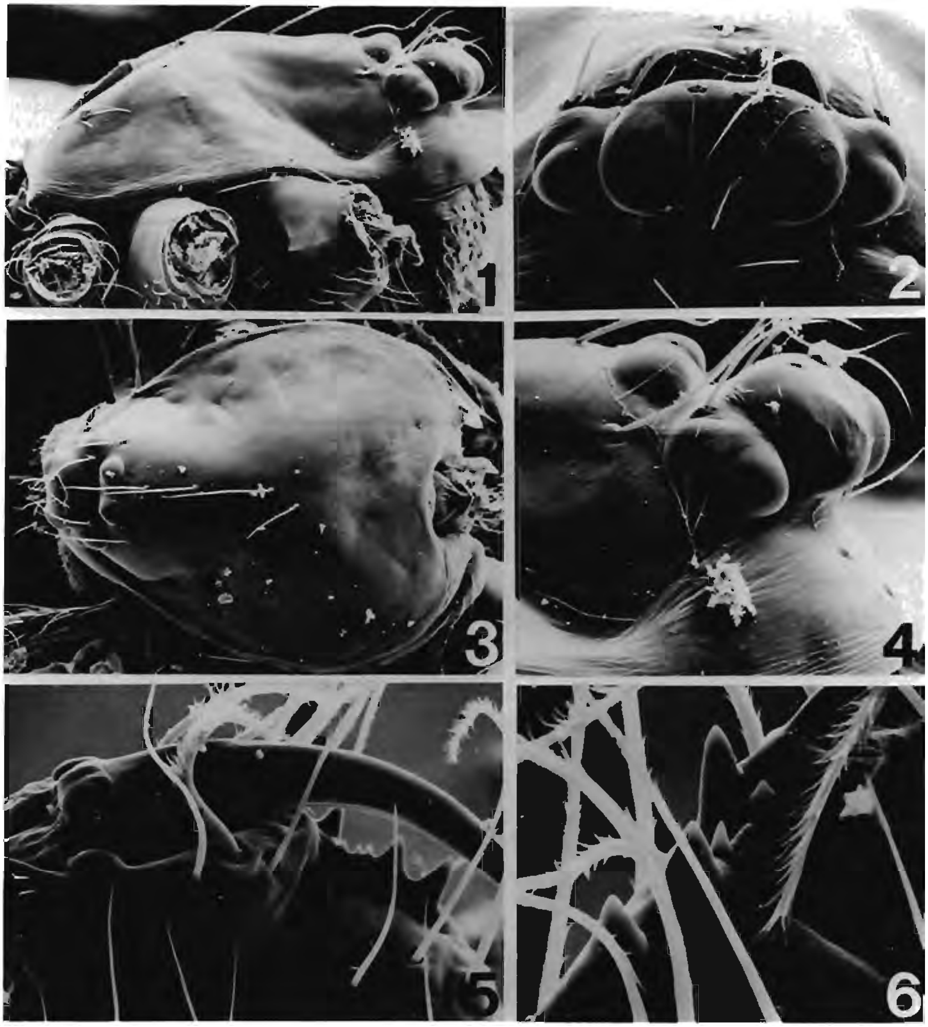
Sternum convex, lateral margin slightly undulate, narrowly rounded posteriorly. Posterior coxae separated by their diameter, anterior coxae largest.

Labium rebordered, width twice length, fused to sternum.

Pedipalpal coxae convex, expanded distally, width equal to length. Abdomen oval, with scattered setae. Six spinnerets (Fig. 7), anterior laterals largest; ALS conical, 2-segmented, distal segment small, apex with lateral group of 10 spigots and large mesal spigot; PLS conical, 2-segmented, distal segment small, apex with ring of 6–10 spigots; PMS laterally flattened, 1-segmented, with 3 apical and 3 retrolateral spigots; colulus large, triangular; anal tubercle prominent.

Respiratory system (Fig. 27) with single posterior spiracle just anterior to colulus leading into four long tracheal tubes; anterior spiracles transverse, separate, leading into atria giving rise to 13–14 short trachea-like lamellae; tracheae restricted to abdomen.

Leg formula 1423. Femur I expanded. Male with clasping spines on tibia and metatarsus I. Female with ventral subdistal sclerotised spot on femora I (Fig. 22) and II. Patellae with distal, tibiae with proximal dorsal bristles. Tibiae with 2–3 or 3–3 dorsal trichobothria, metatarsi with 1 retrodorsal trichobothrium at mid-

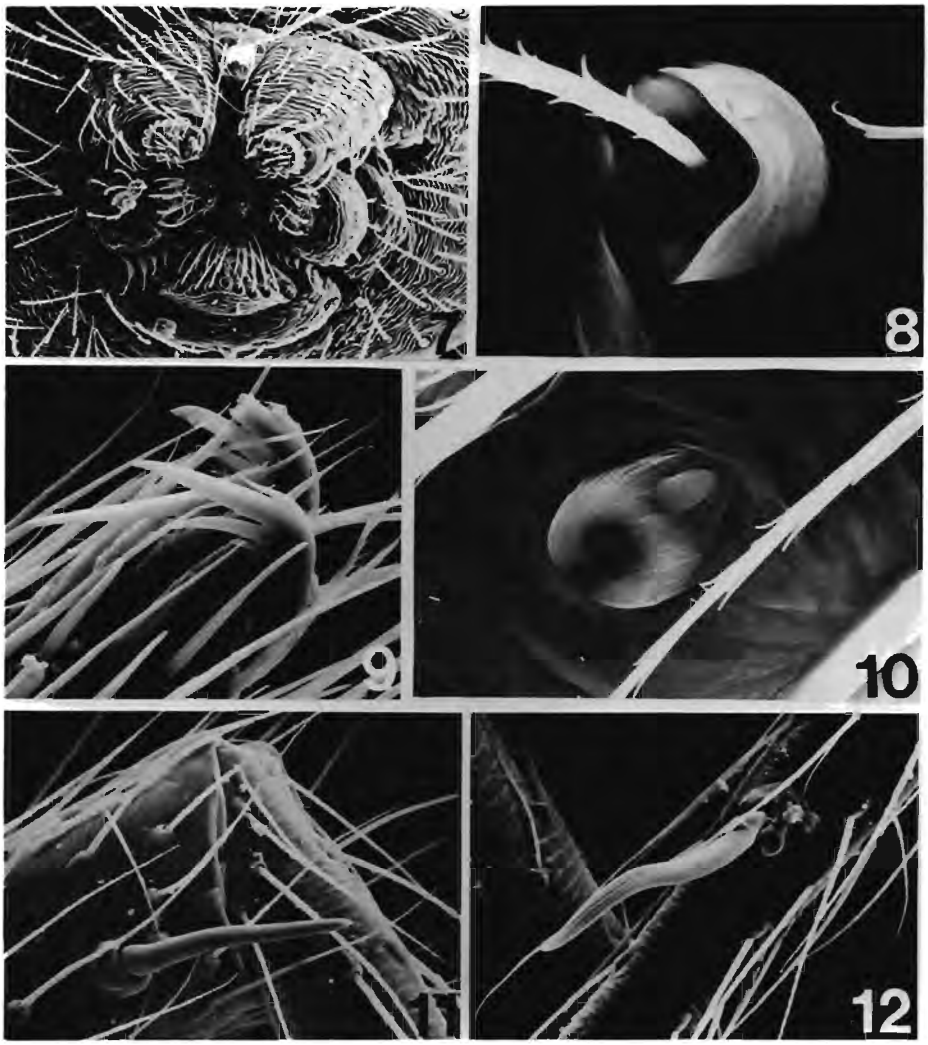


Figs 1–6. *Isela okuncana* sp. n. 1, 3, 5, 6, female. 2, 4, male. 1 Carapace, lateral. 2. Ocular area, anterior. 3. Carapace, dorsal. 4. Ocular area, lateral. 5. Chelicera, anterior. 6. Cheliceral teeth and denticles, view from inner margin.

segment, palpal tibia of female with dorsal pair; trichobothrial base with lateral plate (Fig. 8). Tarsal organ (Fig. 10) capsular, oval, with distally directed pore, located on dorsum of proximal third of segment. Tarsal claws (Fig. 9) slender, STC with several small teeth, ITC elongate, without teeth; female palpal tarsus without claw.

Male palpal tibia elongate, cup-shaped, with series of stout spines at apex of dorsum. Cymbium rotated so alveolus is dorsal, with apical projection. Bulb nearly circular, embolus and conductor associated for nearly entire length. Epigynum with simple, posterior plate.

Distribution: Eastern South Africa.



Figs 7–12. *Isela okuncana* sp. n. 7–10, female. 11–12, male. 7. Spinnerets. 8. Trichobothrial base, tarsus III. 9. Claws, tarsus II. 10. Tarsal organ. 11. Tibia I, anterolateral, clasping spine. 12. Metatarsus I, ventral, clasping spine.

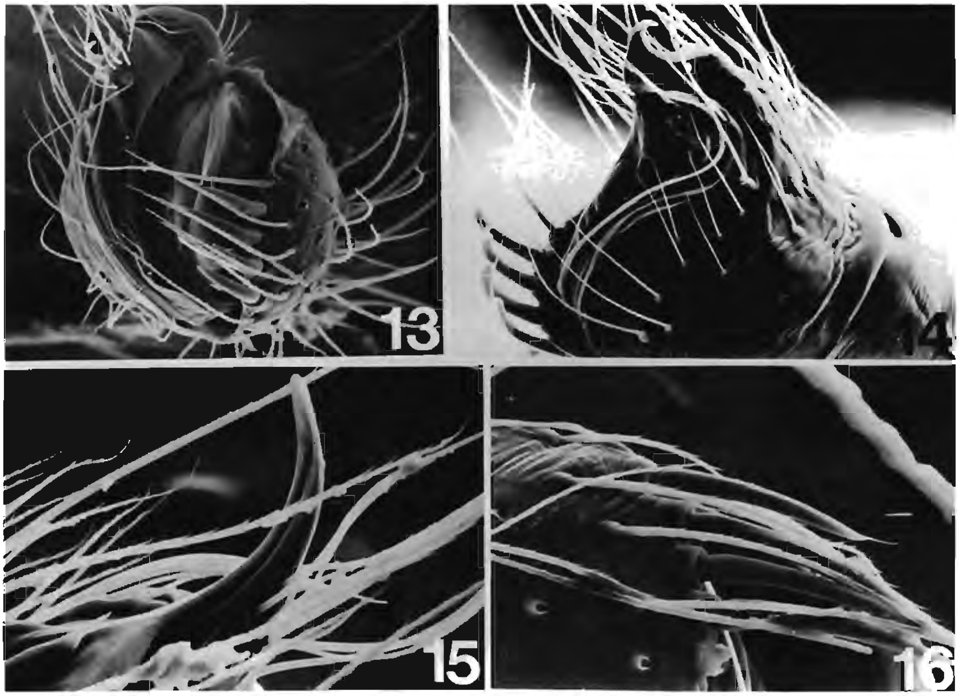
Isela okuncana sp. n.

Figs 1–30

Etymology: From the Zulu *okuncane*, referring to something small.

Diagnosis: Recognised by characters of genus, and by form of ♂ (Figs 23–26) and ♀ (Figs 21, 28) genitalia.

Male: Total length 1,59 (1,47–1,68). Carapace yellow-brown to grey, darker around AER, on posterior portion of caput, and along lateral margin, dark mottled lines radiating from thoracic fovea. Sternum and labium dark grey, chelicerae,



Figs 13–16. *Isela okuncana* sp. n., male palpus. 13. Apex. 14. Cymbium, dorsal, showing path of embolus. 15. Cymbium, anteroapical projection. 16. Tibia, apical spines.

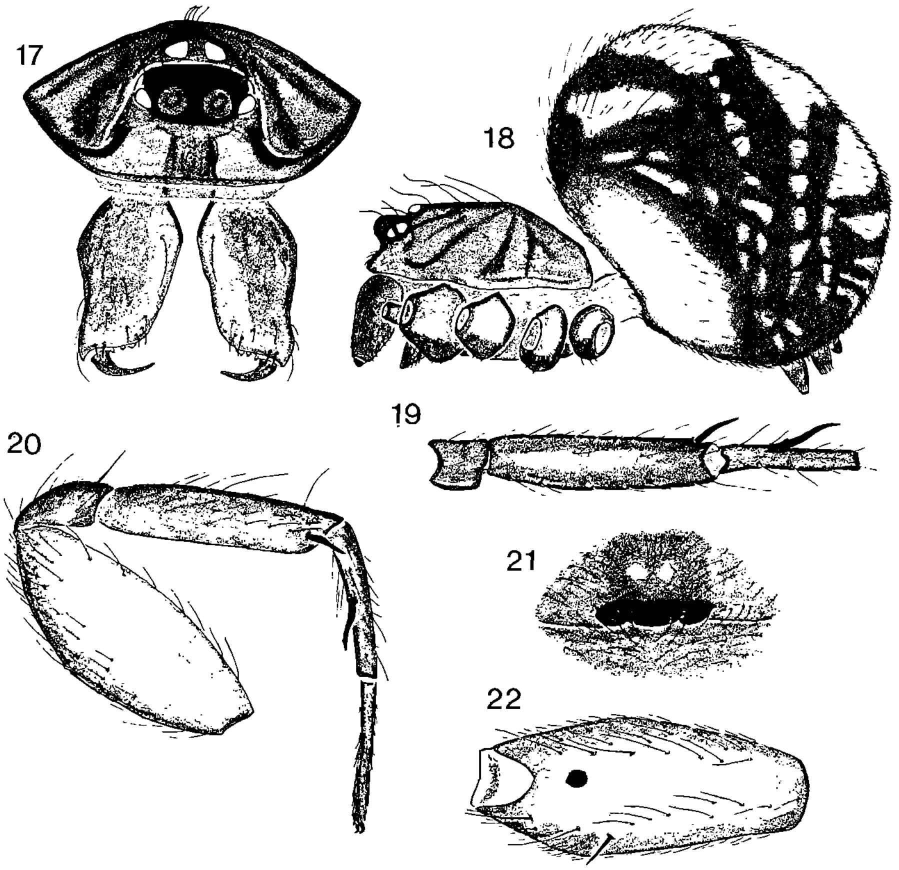
endites, legs, and palpus yellow-brown; grey at base and sides of endites; grey annuli on legs II–IV subbasally and subapically on femora, apically on patellae, tibiae, and metatarsi. Abdomen mottled dark grey, with 3–5 pairs of dorsolateral pale marks and posterodorsal row of 3–5 pale spots; sides with oblique pale streaks, venter pale with complete dark transverse band behind gastric furrow and broken band before spinnerets.

Carapace 0,79 (0,76–0,83) long, 0,64 (0,63–0,65) wide, 0,23 (0,21–0,255) high at thoracic groove; deep submarginal depression behind level of PME; thoracic declivity gently sloping, caput flat. Glabrous except for row of 4–5 long setae on dorsum of caput, 2 pairs between PLE–PME, and 1 pair behind AME. Clypeus concave, sloping anteriad to lower margin, height 0,18 (1,6–2,0) times diameter AME. Ratio of eyes AM:AL:PM:PL, 1,375:1,0:1,125:1,05; AME, PME separated by their radius, interocular distances: AM–AL 0,005, AM–PM 0,07, PM–PL 0,02, AL and PL contiguous. Ocular quadrangle, 1,07–1,15 times longer than wide, narrowed posteriorly, anterior 1,17–1,25 times width of posterior; OQA 0,15 (0,14–0,16), OQP 0,12 (0,11–0,13), OQL 0,17(0,16–0,17). Chelicerae 0,26 (0,23–0,29) long, promargin of fang furrow bare, retromargin with 3 teeth and 3 tiny denticles. Sternum, labium, and endites sparsely covered with fine hairs; sternum 0,48 (0,47–0,5) long, 0,45 (0,44–0,46) wide; labium 0,09 (0,085–0,095) long, 0,17 wide; endites 0,16 long, 0,15 (0,14–0,16) wide.

Leg formula 1423. Legs glabrous, sparsely covered with fine hairs; patellae with dorsoapical, tibiae with subbasal retrodorsal bristles. Leg I (Fig. 20) with anteroventral clasping spines (Fig. 19), subapical on tibia (Fig. 11), subbasal on metatarsus (Fig. 12). Femur I expanded, length/width 2,64 (2,42–2,83). Leg measurements:

	I	II	III	IV
F	0,75(0,72–0,79)	0,64(0,62–0,66)	0,51(0,5–0,54)	0,59(0,585–0,595)
P	0,27(0,24–0,03)	0,25(0,23–0,265)	0,22(0,21–0,22)	0,23(0,22–0,24)
T	0,57(0,56–0,585)	0,46(0,45–0,48)	0,34(0,33–0,37)	0,48(0,46–0,5)
Mt	0,4(0,38–0,41)	0,38(0,37–0,4)	0,35(0,33–0,36)	0,4(0,39–0,425)
t	0,39(0,37–0,41)	0,37(0,36–0,38)	0,35(0,33–0,37)	0,42(0,4–0,46)
Total	2,38(2,27–2,495)	2,1(2,03–2,185)	1,77(1,7–1,86)	2,12(2,055–2,22)

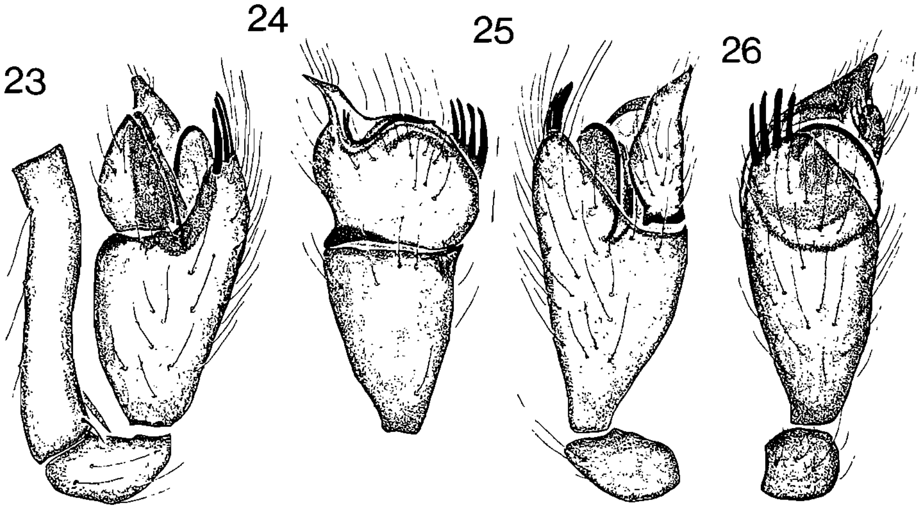
Abdomen oblong, length 1,59 (1,21–1,92) times height, glabrous, sparsely covered with fine hairs; 0,94 (0,9–1,02) long, 0,8 (0,755–0,86) wide, 0,62 (0,53–0,74) high.



Figs 17–22. *Isela okuncana* sp. n. 17–18, 21–22, female. 19–20, male. 17. Cephalothorax and chelicerae, anterior. 18. Body, lateral. 19. Patella to metatarsus I, ventral. 20. Leg I, anterolateral. 21. Epigynum, ventral. 22. Femur I, ventral.

Palpus (Figs 23–26) with femur slender, 0,37 (0,36–0,41) long, with subapical retroventral spine, patella 0,14 long; tibia elongate, expanded and concave distally, 0,36 (0,33–0,39) long, with 4 stout retrodorsal spines at apex; cymbium articulated with venter of tibia, broad, 0,2 (0,19–0,2) long, with grooved anteroapical projection (Fig. 15). Palpal bulb circular, embolus and conductor confluent, arising retroapically on bulb and making complete circle to cross onto dorsum of cymbium (Fig. 14); embolus and conductor sharply curved.

Female (Figs 17, 18): As in ♂ except where noted. Total length 1,78 (1,51–1,94). Carapace 0,77 (0,68–0,85) long, 0,65 (0,56–0,7) wide, 0,26 (0,255–0,265) high; shallow submarginal depression just behind level of PME. Clypeus 0,12 (0,11–0,13) high, height 2–2,5 times diameter AME. Ratio of eyes AM:AL:PM:PL, 1,43:1,14:1,14:1; interocular distances: AM–AL 0,005, AM–PM 0,085, PM–PL 0,0265, AL and PL contiguous. Ocular quadrangle 1,0–1,2 times longer than wide, narrowed posteriorly, anterior 1,28–1,4 times width of posterior; OQA 0,17 (0,15–0,18), OQP 0,125 (0,11–0,14), OQL 0,18 (0,16–0,2). Chelicerae 0,29 (0,24–0,34) long, retromargin of fang furrow (Fig. 5) with proximal row of 2 teeth and single distal tooth, 3 tiny denticles (Fig. 6) between middle and distal teeth. Sternum 0,48 (0,46–0,5) long, 0,46 (0,41–0,49) wide; labium 0,085 (0,07–0,095) long, 0,19 (0,16–0,21) wide; endites 0,16 (0,15–0,18) long, 0,16 (0,14–0,17) wide.

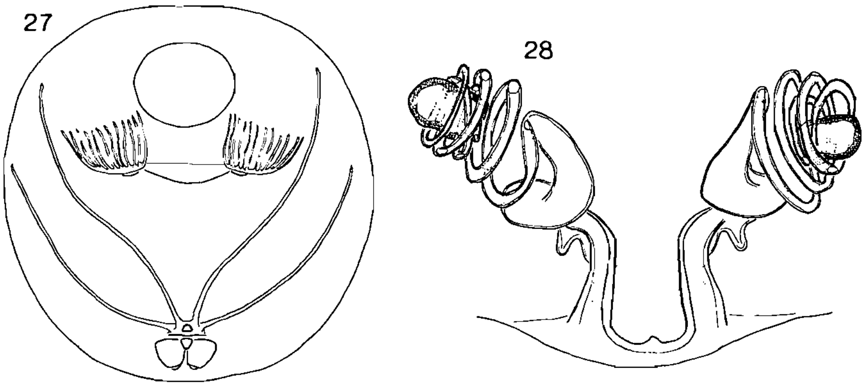


Figs 23–26. *Isela okuncana* sp. n., male palpus, left. 23. Anterolateral. 24. Ventral. 25. Retrolateral. 26. Dorsal.

Leg formula 1423. Femur I expanded, length/width 2,25–2,77; leg I without clasping spines; sclerotised subapical spots (Fig. 22) present on venter of femora I and II. Teeth on superior tarsal claws: I, 5–6, II, 6, III, 6, IV, 5. Leg measurements:

	I	II	III	IV
F	0,68(0,57-0,7)	0,62(0,41-0,7)	0,52(0,46-0,585)	0,62(0,57-0,67)
P	0,29(0,24-0,32)	0,255(0,22-0,28)	0,24(0,22-0,255)	0,24(0,21-0,265)
T	0,53(0,44-0,61)	0,43(0,37-0,48)	0,34(0,29-0,38)	0,5(0,44-0,55)
Mt	0,4(0,35-0,46)	0,35(0,32-0,38)	0,35(0,32-0,37)	0,4(0,35-0,425)
t	0,38(0,35-0,39)	0,375(0,36-0,39)	0,35(0,34-0,37)	0,4(0,37-0,425)
Total	2,28(1,95-2,48)	2,03(1,68-2,23)	1,8(1,63-1,96)	2,16(1,94-2,335)

Palpus with femur 0,22 (0,2–0,24) long, patella 0,1 (0,085–0,12) long, tibia 0,17 (0,16–0,19) long, tarsus 0,23 (0,2–0,255) long, total length 0,72 (0,645–0,805). Palpal femur without spines, tarsus without claw. Abdomen oblong to globular, length 1,27 (1,19–1,38) times height; 1,23 (1,07–1,38) long, 1,07 (0,9–1,13) wide, 0,97 (0,78–1,12) high. Epigynum as in Figure 21, with central and lateral lobes on posterior plate. Copulatory ducts large, tapering anteriorly, with short retrolateral diverticulum; spermathecal duct long, coiled, making 5 or more turns and distally encircling spermathecae; spermathecae small, oval (Fig. 28).



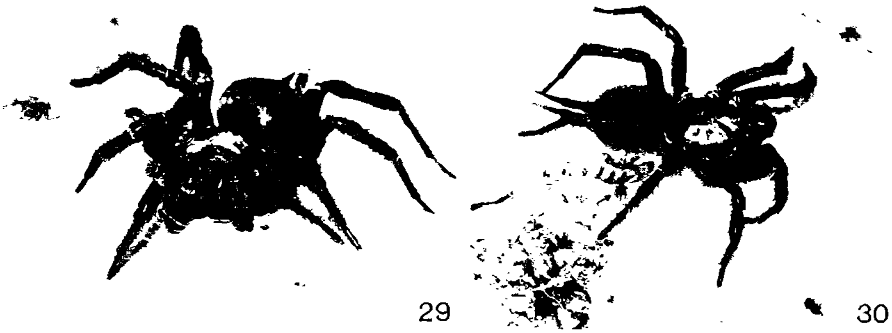
Figs 27–28. *Isela okuncana* sp. n. female. 27. Abdomen, cleared, showing respiratory system. 28. Spermathecae, cleared, dorsal.

Materal examined: SOUTH AFRICA: *Natal:* Holotype ♂ taken from web of *Allothele teretis* Tucker at Mhlopeni Nature Reserve, 6 km SE Muden (29°02'S:30°21'E), elevation 900 m, 3–4.ii.1984, C. Griswold & T. Meikle Griswold, deposited in the Natal Museum (NM type number 2998). Paratypes, also from *A. teretis* webs (3–4.ii. and 11.vi.1984): 4♂ 7♀, Natal Museum, 1♂ 1♀ each in National Collection of Arachnida, Pretoria, American Museum of Natural History, New York, and California Academy of Sciences, San Francisco.

NATURAL HISTORY

I. okuncana were collected near the Tugela River in Natal, South Africa, an area with a hot, seasonally dry climate and vegetation categorised as Valley Bushveld (Acocks 1975). Specimens were taken from the sheet or curtain webs of *Allothele teretis* typically built in cool, shady situations such as on tree trunks and in holes in stream banks (see Coyle 1984). The mysmenids moved freely and quickly on, under, and through the silken structure. All stages of *I. okuncana* can be found in the web of a single adult *A. teretis*, including young to penultimate juveniles, adult males and females, and females with eggsacs. Mysmenids were found in each of nine webs of adult *A. teretis* sampled in June, with an average of 7,55 (2–13) spiders per web. Small or large juveniles were occasionally found in webs of juvenile (less than 1 cm length) *A. teretis*. They were never collected outside of the host's webs.

Observations on feeding, reproductive, and silk spinning behaviour were made under laboratory conditions on the webs of captive *A. teretis* (Figs 29, 30). The mysmenids were observed to feed on prey or prey fragments from the host. They would orient and move from all parts of the web (as much as 12 cm from the host) toward prey if the host was actively subduing or feeding on it. The host responded aggressively if the mysmenids were perceived, violently shaking the prey or dragging it away, often leaving fragments behind, and causing temporary retreat of the parasites. Feeding was most frequent on abandoned prey fragments, or on appendages of prey farthest from the host. One individual was observed to feed undisturbed for 5 hours until satiation. The smallest individuals appeared to feed nearest the host, even on the bolus of food. Feeding also occurred on prey or prey fragments killed by *A. teretis* if placed in a host's web without the host present: *I. okuncana* were not observed to orient toward these items and it is believed that feeding resulted from accidental encounters.



Figs 29–30. *Isela okuncana* sp. n. in web of *Allothele teretis* (photos by T. Meikle Griswold). 29. Kleptoparasite and host. 30. Host and mealworm prey, kleptoparasite near prey in center (arrow).

The mysmenids produce draglines at all times, but were not observed to build webs. Individuals confined without hosts for several days produced irregular silk-work in the container; when microscopically examined these appeared to be superimposed and interconnected draglines. Small insects introduced were not killed, although one instance of cannibalism was observed.

Mating was witnessed four times and occurred within the diplurid web. The male and female hung inverted and face to face, with the male reaching over the female's venter to copulate. The first legs were interlocked, with no contact between cephalothoraces. The eggsac is nearly spherical, covered with smooth, white silk, and equal in size to the female abdomen. The female carries it within the host's web attached to the spinnerets and supported by the fourth legs.

The behaviour of *I. okuncana* is neatly tailored to life in the web of its diplurid host, and it appears that this relationship is one of obligate kleptoparasitism.

DISCUSSION

The family Mysmenidae Simon was provisionally defined by Platnick & Shadab (1978) on the basis of four presumably synapomorphic characters: 1, the presence of a clasping spine on metatarsus I of the male; 2, the cymbium of the male palpus with lobes or apophyses; 3, a ventral sclerotised spot subdistally on femur I of the female; 4, tiny denticles scattered between the cheliceral teeth. Their definition was based upon a study of only those genera occuring in the New World. Brignoli (1980) cautioned that acceptance of this definition of the Mysmenidae must await assessment of the distribution of these characters among the several Old World genera tentatively placed in this family, as well as a better understanding of the relationships among the great variety of included genitalic forms. *Isela* conforms to the familial definition of Platnick & Shadab in all respects: 1, anteroventral clasping spines occur on both tibia (Fig. 11) and metatarsus (Fig. 12) I of the male; 2, the cymbium of the male palpus is prolonged into an acute anteroapical projection with a retrolateral groove (Fig. 15); 3, ventral sclerotised spots occur subdistally on both femora I (Fig. 22) and II of the female; 4, tiny denticles occur between the cheliceral teeth, although these are reduced in number to 3 (Fig. 6).

Separate generic status for *Isela* is supported by the morphology of the cephalothorax. The cephalothorax is low, the caput is flat, and the ocular area is not raised in either sex. Similarly low cephalic regions occur in females of *Leviola* Miller (1970) and *Kekenboschiella* Baert (1982), but the ocular regions are unmodified. Modification of the ocular region so that the PME are situated on a separate tubercle and separated from the PLE and AER by a distinct depression (Figs 1, 4), and the presence of a submarginal depression (Fig. 1) on the sides of the carapace are unique within the Mysmenidae.

The unique presence, among all the genera attributed to the Mysmenidae, of strong spines or cusps on the apex of the tibia of the male pedipalp suggests a sister-group relationship between *Isela* and the tropical American genus *Mysmenopsis*. In *Isela* these spines are long, stout, and dorsally situated (Figs 13, 16), whereas in *Mysmenopsis* they are reduced to short, stout cusps that are ventrally or retroventrally located. Considering the degree of morphological divergence between these genera and the highly specific lifestyles reported for many species (as kleptoparasites in the webs of diplurid spiders), this African-American disjunct distribution may be an ancient one.

ACKNOWLEDGEMENTS

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